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Combat Crew

strategic air command



FEBRUARY 1985
★★★★★

Combat Crew

GEN BENNIE L. DAVIS
COMMANDER IN CHIEF, SAC

BRIG GEN GEORGE LEE BUTLER
INSPECTOR GENERAL

COL CHARLES J. WINGERT
DIRECTOR OF SAFETY

STAFF

EDITOR
MAJ BOB NEIDRICK

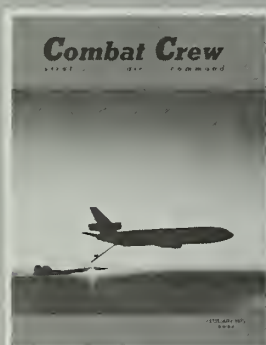
ASSOCIATE EDITOR
KEN MAASSEN

ART EDITOR
W.A. KIRKPATRICK

EDITORIAL ASSISTANT
M. J. ABOUD

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ON OUR COVER

— A KC-10A Extender aircraft and an SR-71 Blackbird aircraft during inflight refueling operations. For more on the SR-71 see page 4.

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"Are We Properly Managing Government Property?"

Looking back on 1984, three very important and closely related issues consumed vast amounts of time, energy and resources within the Air Force as well as the Strategic Air Command. Those three areas are: the prices we pay for the parts/equipment we buy; the soundness of our practices when repairing spare parts and returning usable property to base supply, and, finally, how long we keep serviceable property before disposing of it. The bulk of correspondence and work in these areas has focused in the Logistics disciplines, but each of the topics surfaces a much more basic question that applies to each and every person, military or civilian within the Department of Defense. We must honestly look at ourselves and ask "are we properly managing government property?"

The Strategic Air Command has been combating high prices for spare parts since 1979. Through the Air Force Zero Overpricing Program (ZOP), all Air Force employees continue to have an opportunity to challenge suspected cases of overpriced government property. The program acts as a check and balance on the acquisition process because an important premise in the program is that the ultimate user knows best how much something should cost. Financial rewards to individuals discovering valid overpricing cases are offered through the Air Force Suggestion Program. Furthermore, critical base Operations and Maintenance (O&M) budgets are reimbursed for improperly overpriced items so additional supplies can then be bought.

In September, congressional testimony by two military members focused attention on the practice of throwing away usable supplies instead of returning them to base supply. This command thoroughly investigated this matter and pinpointed no less than nine major reasons why people throw away usable supplies. The Air Staff subsequently published a resume of the twelve most pressing policy and procedural problems as a road

erly Managing Property?"

map for the Air Force to tackle the problem. Revised Air Force and SAC methods now encourage organizations as well as individuals to retain supplies they reasonably expect to use in the foreseeable future. Simplified turn-in procedures promote easy movement of property from the work area to base supply.

The last issue involving government property management is retaining and ultimately disposing of property that is no longer needed. In March 1984, the Secretary of the Air Force imposed a moratorium on transferring serviceable and economically repairable items to Defense Property Disposal Office (DPDO). The Air Force Inspector General (IG) discovered serious deficiencies in the methods of computing property excesses. The Air Force IG also confirmed previous SAC findings that customers regularly requested supplies (principally aircraft parts) after Air Force disposal formulas considered them no longer needed at the base. Program changes are now in place so supplies are retained and decisions to send property to DPDO are made by people — not the computer.

It's important for everyone to reflect, periodically, on our responsibilities for government property under our possession and control. There is every reason to believe the Air Force will continue to be under close scrutiny by Congress and the media in the future as we have been in the past. Continuing disclosures of property management deficiencies can seriously detract from our efforts to fund our weapon system modernization and replacement programs. Taken as a whole, we must work hard to dispel the general attitude that we pay too much for supplies, that we often throw these expensive parts away, or dispose of them before the need is finished.

To fulfill our responsibilities for guarding the public's trust and not compromise our weapon system modernization and replacement program, everyone's concerted effort and attention to the problem is needed. Aware-

ness and your participation in the Zero Overpricing Program will attack the overpricing problem from the "grass roots." As has been the case so often in the past, SAC's achievements and forward looking initiatives are many but we need everyone's help to sustain our fine efforts. We must remind our people frequently of the rules and practices of prudent property management; awareness is the key to success. Focusing attention on these problems will benefit the Air Force, your base and our key mission — **strategic deterrence.**★★

Maj Gen John J. Doran, Jr.
DCS Logistics
Strategic Air Command



SAC's MACH III Squadron: the 1SRS



Capt Duane W. Deal
SR-71 Pilot

March 1913: the 1st Aero Squadron is created; December 1964: the 1st flight of the SR-71 prototype is flown . . . seventy-one years after the 1st Squadron was formed, and twenty years after that first SR-71 flight, let's take a brief look at the history and accomplishments of both a unique unit and aircraft in the USAF/SAC arena: the 1st Strategic Reconnaissance Squadron and its SR-71.

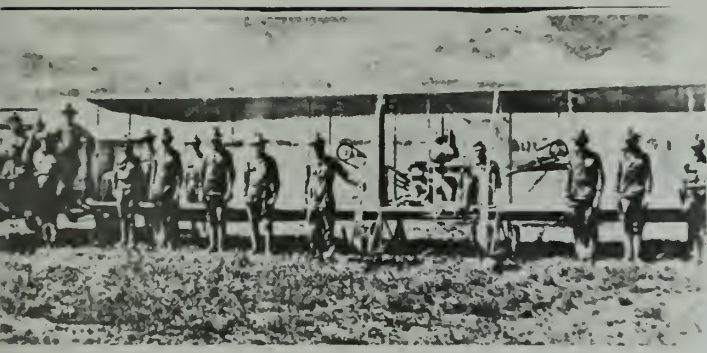
Tucked away in California's Sierra foothills, just east of the twin cities of Marysville and Yuba City, SAC's Beale AFB serves as home to a still active pioneer in aviation history — the 1st Strategic Reconnaissance Squadron. The oldest flying unit in the United States, the 1SRS recently celebrated its 71st year of continuous service. Part of the legacy of the 1SRS is that it has flown more types of aircraft from more permanent locations than any other unit in the Air Force (and likely the world).

THE SQUADRON

Created in March 1913 as the 1st Provisional Aero Squadron, the unit has had seven name changes to coincide with its evolving responsibilities. As the 1st Aero Squadron under the command of then Capt Benjamin D. Foulois, it participated in Brig Gen John Pershing's early campaign against the Mexican bandit Pancho

Villa. As the first U.S. flying unit to arrive in Europe for WWI, it went on to chalk up 13½ confirmed combat victories. With a subsequent name and mission change to the 1st Bombardment Squadron, the 1st assisted Brig Gen Billy Mitchell in his famous bombing tests on naval vessels. The squadron also helped Charles Lindbergh plan his record trans Atlantic flight from New York to Paris. During WWII, the 1st was somewhat curtailed operationally by being initially assigned to train B-17 and B-29 bomber crews. In 1944, the unit took its B-29s to the Pacific theater, flying in raids against Japanese targets, including the island of Iwo Jima prior to the U.S. marine assault. Following WWII, the 1st flew RB-29 and RB-36 aircraft as its mission changed to photo reconnaissance. Changing back to bombers in 1950, the squadron eventually transitioned to the B-47 and set a record in 1953 for a non stop 8300 mile flight from its home base at Mountain Home AFB, Idaho, to New Zealand.

In January 1966, the 1SRS assumed its current mission of strategic reconnaissance at its present base — Beale AFB, CA. It was here that the squadron became the first unit to fly the world's fastest, highest flying operational aircraft, the SR-71 "Blackbird." Flying worldwide missions in support of national intelligence requirements on virtually a daily basis, the unit continues to operate under a veil of secrecy only partially



Seven pilots, a small ground crew, and five Wright Pusher aircraft were the total of the US Army's air strength in 1913. This group formed the 1st Aero Squadron (now the 1SRS) — the oldest air arm in today's Air Force.

lifted over the years. A logical and usually accurate supposition is that wherever an area of international tension has erupted, the SR-71 is tasked to pay a visit. To accomplish such taskings, the 1SRS aircrews fly not only from Beale AFB, but also from two overseas detachments: Kadena AFB, Okinawa, and RAF Mildenhall, England. This "tri-basing" of the SR-71 has helped it retain a vital position in the U.S. reconnaissance arena, as it is able to react more quickly and less predictably than the satellites currently in use.

One of the few purely operational units in the USAF, the 1SRS begins its administrative chain of command with its parent wing, the 9th Strategic Reconnaissance Wing. After the 9SRW, the path continues to the 14th Air Division at Beale AFB, to the 15th Air Force at March AFB, then up to HQ SAC at Offutt AFB. Operationally, however, agencies desiring SR-71 reconnaissance (i.e., CIA, PACOM, CINCLANT, etc.) forward their requests to the Joint Reconnaissance Center (JRC) at the Pentagon. The JRC then coordinates with the Strategic Reconnaissance Center (SRC) at HQ SAC for mission development. With HQ SAC tasking, the 1SRS, 9SRW KC-135Qs, and other 9SRW branches work together to complete the SR-71 mission profile.

Training of SR-71 aircrews is accomplished at Beale AFB under the control of the 4029th Strategic Reconnaissance Training Squadron, which also prepares pilots for high altitude reconnaissance in the U-2/TR-1. The average SR-71 crew training duration is approximately 11 months and includes a combination of academic and field training detachment (FTD) instruction, 56 simulator flights, and an accumulation of 100 hours of SR-71 flight time prior to the crew's first operational deployment. In terms of mileage covered, SR crews are perhaps the "most traveled" crews in training in the world: their 100 flight hours in training equates roughly to 6½ trips around the earth. In addition to flying the SR-71, crews also maintain proficiency in the T-38 Talon. The T-38 is utilized at Beale as an SR-71 chase aircraft, used by SR-71 pilots and RSOs to enhance their functioning as integral crews, and finally, used for pilot proficiency (the subsonic handling characteristics of the SR-71 are closely matched by the T-38).

THE 1SRS EMBLEM



The unit emblem has changed little from the design approved back in 1931 by military heraldry officials, and graphically displays the unit's mission and history in a nutshell. The hunter gazing intently into the distance illustrates the unit's original observation mission and its present reconnaissance function. The sunrise in the background signifies that the unit's early members were present at the dawn of military aviation. The four rays of the sun denote the unit's first military campaigns, and the arc of 13 Maltese Crosses stands for the 1st's World War I victories. The bright yellow band around the edge alludes to the unit's early service along the US-Mexican border.

THE HABU PATCH



The HABU patch is awarded to SR-71 aircrews after their first operational mission. The "Habu" nickname was given to the Blackbird by Okinawans who proclaim the similarity between the appearance of the SR-71 and the deadly Habu snake. The red, white, and blue represent the US flag, while the two stars represent the two-man crew of the Blackbird. An "SR-71" caption and aircraft frontal silhouette also adorn the patch.



The red, white, blue, and black "3+" patch is awarded to SR-71 crewmembers signifying that they have flown the SR-71 over Mach 3. The design has three symbolic shock waves created by an SR-71 silhouette emblazoned with a "3+" on its airframe.

SAC's MACH III Squadron

An SR-71A returning back to Beale AFB is chased by a T-38 during its recovery. The aircrews of the 1SRS fly both aircraft — the 25th and 26th types of aircraft that squadron crews have flown in the unit's 71-year history.

In the 20 years since President Lyndon Johnson first announced the existence of the SR-71, probably as many guesses as facts have been written about its true mission and capabilities. Developed from the A-11/YF-12 interceptor concept, it was conceived to perform both pre-attack and post attack strategic reconnaissance. To do this mission, a multitude of surveillance systems and sensors can be installed in the fuselage bays of the aircraft. Flying above 80,000 feet at speeds in excess of 2,000 mph (Mach 3), the SR-71 can survey 100,000 square miles of the earth's surface in one hour.





The SR-71 "Blackbird"



PRIMARY FUNCTION: Strategic Reconnaissance, capable of surveying over 100,000 sq miles each hour

PRIMARY CONTRACTOR: Lockheed Aircraft Corp

POWER PLANT: Two Pratt & Whitney J58 Turbojets

THRUST: Greater than 30,000 lbs each engine with afterburning

DIMENSIONS: Fuselage length: 107 ft, 5 in
Wingspan: 55 ft, 7 in
Height: 18 ft, 6 in

SPEED: More than 2,000 mph (Mach 3+)

CEILING: Above 80,000 feet

RANGE: More than 2,000 miles at Mach 3;
Global with aerial refueling

CREW: Two — Pilot and reconnaissance systems officer (RSO)

FIRST FLIGHT: December 22, 1964 (USAF delivery began in Jan 1966)

The A-11/YF-12

A delta wing aircraft, the SR-71 lacks the traditional elevators and ailerons that conventional aircraft use for pitch and roll. Instead, the Blackbird uses "elevatorons," which act together for pitch and differentially for roll. The delta wing design provides superior performance and lift qualities at higher altitudes; however, the elevator controls with an absence of flaps and/or slats require relatively high takeoff and landing speeds and angles of attack. The huge J58 engines, located mid-wing on the SR, provide over 30,000 pounds of thrust apiece. Unique to the SR-71, the J58 behaves like a conventional turbojet at low mach speeds. As the SR accelerates to higher mach speeds, the external intake spike acts as a sophisticated vari-ramp in conjunction with internal door systems to produce a near ramjet operation (which makes the SR more efficient and fuel conservative supersonic than it is subsonic). The list of concepts common only to the SR-71 is quite beyond the scope of this article, but a few hardware items are worth highlighting here:

- One of a kind fuel, JP-7, with a flash point so high that a match can't ignite it (a chemical catalyst is required).

- The absence of fuel tank bladders and seals, since none are in existence to withstand the extreme temperatures generated at Mach 3+ (which leads to the SR dripping fuel prior to takeoff).

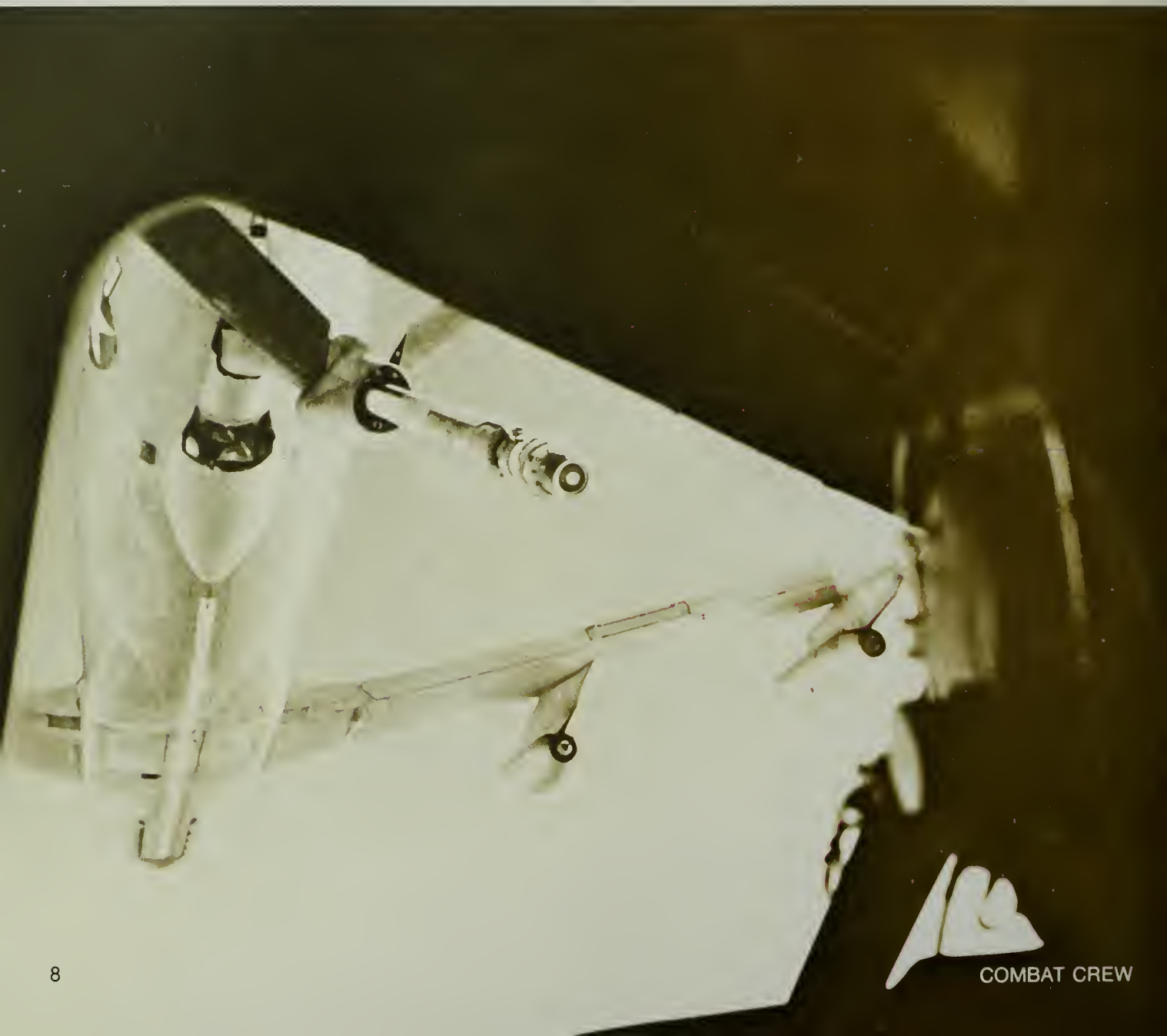
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TO ERR IS HUMAN . . .

We had just finished a routine night refueling with an RC-135 on one track and were enroute to the air refueling control point (ARCP) for a different track when command post called us on the HF radio to tell us the second receiver would be anywhere from 15 to 45 minutes late. No sweat. I called center and asked for a delay at the air refueling initial point (ARIP) until one-half hour past the original air refueling control time (ARCT). I preferred to delay at the ARIP because the ARCP was over water, near the boundary of the air route traffic control center (ARTCC) and I didn't want to be bogged down by the HF. Besides, the receiver was going operational, and I

computed that the only way we could give him all the gas he needed was to start refueling at the IP and cut the track short no later than 10 minutes after the ARCP. This was assuming a delay of up to one hour. We set up on orbit at max endurance airspeed near max endurance altitude.

After nearly an hour, we made contact with our receiver and agreed upon an on-course rendezvous. I elected to have the copilot fly the aircraft during the first part of the rendezvous so that I could talk with the receiver and tell him about our game plan for the track. While still 10 minutes out from the rendezvous point, the receiver called to ask whether we'd be willing to



submit a rather "extensive" flight plan change request to center for them. I had handled such requests before to help out a busy crew, and saw no reason to say no now. The change ended some 20 elements later.

There was a lot to do during the next 20 minutes, so I decided to have the copilot continue to fly while I ran checklists, set up the fuel panel, and passed on the flight plan change. Though very proficient, the co had only handled the HF once before, and this just wasn't the night to check him out further. The AR was uneventful although the receiver was somewhat erratic toward the end because of the large offload and occasional light turbulence. Thankfully, the center had already picked up the flight plan from somewhere (presumably the receiver's home station), and we didn't have to bother with flight service. With the offload complete we wished the receiver a good flight and headed for home. I noted that we had 3000 more pounds of fuel at the next point than we had planned for.

In the turn toward home, we picked up a bit of ice on the windows as we passed through a cloud. (The moon was pretty bright and we had been flying along the cloud tops most of the night.) Nothing serious; it was gone in about 30 seconds. Just to be on the safe side, we decided to use the engine anti-ice. When the copilot turned the switch on, the indicator light did not come on. It did not press-to-test, so I instructed the copilot to swap the light bulb out with a different one. It still didn't work. Oh well, another write-up. Once I was sure we were in the clear, I'd have the copilot turn off the anti-icing switch and note whether there was a change in the EPR gauges. I had not noticed any change when the system was first turned on.

The boom reported up front after completing his post air refueling checklist and we started preparations for the descent toward home. Suddenly, the number four engine began to wind down. The copilot noticed it first, and informed the crew. I took control of the aircraft and completed the bold face for an engine failure in flight. The copilot continued with the rest of the checklist and then pulled out the Dash One for a review of engine failure procedures. The boom operator automatically checked off intercom and went back to the overwing hatch to scan the engine. He confirmed my suspicion; there was, he said, about an inch of ice on the inlet of number four. I swiftly diagnosed the failure to be a result of ice ingestion, and turned on the flight start switches for the remaining engines. Strange, I had never known ice to accumulate to such an extent on an engine inlet in so short a time with almost no accumulation on the windscreen. "This is just like the sim," I said reassuringly to my copilot. Not more than two to three minutes had passed when number one began to fluctuate wildly and then quit. This is getting serious! Again, the boom operator reported icing. Again I concluded ice ingestion. How long before two and three quit?

We were still quite a way from the coast, and each of us silently began to contemplate a night ditching or

bailout . . . The boom operator came forward and for whatever reason glanced at the fuel panel. The main tanks for both outboard engines were empty! I had forgotten to drain the reserves!

Not more than five minutes elapsed between the first engine failure and the successful restart of both engines. The rest of the mission was uneventful . . .

What happened? I have a hundred answers, each pointing the finger at me as the aircraft commander. I had been very diligent in performing HEFOE checks up until the second rendezvous. I completed the preparation for contact and post air refueling checklists, and had followed through with my predetermined plan for how I would handle the scheduled offload. I had coordinated with the crew when changing the fuel panel but I was only thinking of how to deliver the offload, and neglected to assure that sufficient fuel remained for each engine.

While performing copilot duties, I should have been every bit as involved with the fuel panel as I know my copilot would have been had I been flying. It isn't enough to just "mind the store until the owner gets back." And he shouldn't have trusted me to know what I was doing just because I've been around a few years.

Distraction from the important job at hand had a big part in this incident. I was preoccupied with getting the offload as quickly as possible to the receiver, and with talking to both the ARTCC and overwater controllers.

There are many "what if's" you could throw into this scenario. You may think it incredible that both pilots failed to notice the fuel panel, or that I neglected to look for a cause of engine failure beyond the icing problem. In retrospect, so do I. I have read (and learned from) the war stories of others, and have sometimes secretly thought that I could never be so stupid or careless. I was wrong.

We were lucky, and have all learned a valuable though costly lesson. It won't happen to me again.

"A-NONY-MOUSE"



Gallant Eagle 84

... A Tank Crew's View

Captain David C. Heiden
906 AREFS, Minot AFB

“Hey guys, have we got a deal for you!” Oh oh, how many times have we all heard that dreaded phrase, I thought to myself. “You guys are going down to Biggs Army Airfield in El Paso, for Gallant Eagle 84.” Gallant Eagle? Oh yeah, also known as Giant Tent, where we get to play MASH in the desert. Sounds like a great time to go work on my tan and do some SOS. Little did we know we would soon be involved in some of the best flying opportunities available to us in a peacetime situation.

Gallant Eagle 84 was the largest military exercise conducted in the CONUS since 1962. The purpose was to demonstrate the United States' resolve to defend freedom's interests throughout the world. This Joint Chiefs of Staff directed exercise not only proved SAC's combat readiness, but also provided tremendous training for all four branches of the service. By jointly flexing the collective muscles of the combined military forces we identified potential problems and showed the world what we can do. The impressive results of this operation will make potential enemies think twice before threatening our vital national interests.

Biggs Army Air Field in El Paso, Texas (a former SAC base) was selected as SAC's staging area because it closely resembles conditions we might expect to operate under during real world conflict. Thus, we had the opportunity to give our crewmembers and support people first hand experience in a realistic environment. Camp Bare Eagle was a virtual city that rose from the desert. Eight SAC bases sent 135 of their best Prime Beef personnel to build a Bare Base using the new and untested Harvest Bare buildings. In 12 days a complete base with 1200 residents had been constructed from scratch in order to support KC-135 and B-52 flight operations. The high quality of services provided by the many support personnel was truly outstanding. Their many long weeks of hard work paid big dividends for all of us.

In addition to the B-52's flying out of Minot AFB, and the B-52's from Ellsworth staging out of Biggs, KC-135A's from Minot and Ellsworth played a major role while flying out of Biggs. For those of you lucky enough to have flown in the ongoing Red Flag exercises, this operation was similar in many respects. For example, heavyweight takeoffs with anchor refuelings of assorted fighters were done on a daily basis. However, operating out of a bare base, using radio silent procedures until

airborne, and flying in five-ship cell formations presented unique challenges. With a young and relatively inexperienced crew force operating under these realistic and austere conditions, we knew we had to get a head start before leaving home.

To begin with, we had to provide our own mini squadron and all the associated functions that go along with running a flying unit. Schedules, flight plans, charts, fuel logs and takeoff data were all prepared as much in advance as possible. Cell formation procedures in SACR 55-11 and the videotape “Coronet Goatrope” were reviewed, and the booms planned how we would carry all the cargo and passengers. Everyone was looking forward to some good flying.

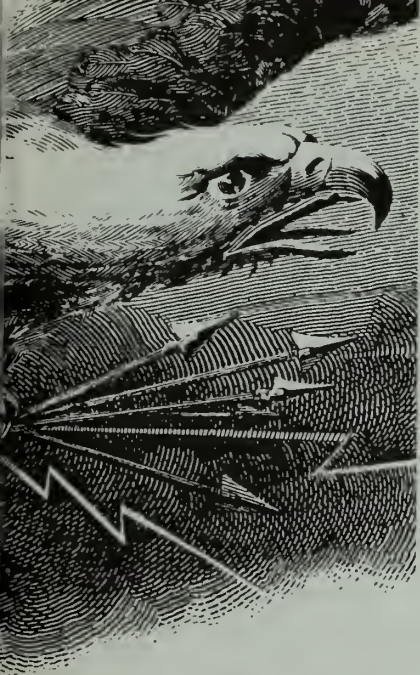
Once we arrived down south we began preparing for the operation by inprocessing, taking SCAT briefings, and more mission planning. Everything was in order, and we were ready to go win the war. As it turned out, that first mission was the proverbial “goatrope” we all like to talk about. However, on each succeeding flight things went better than before. By the end of the eleven day adventure we were all seasoned veterans, ready to take on the world. We all learned many valuable lessons while picking up some worthwhile techniques which may be common to some of you old heads, but new to many others.

One of the most important lessons learned was the need for a comprehensive cell briefing. A good example of what to brief is given in SACR 55-11, Attachment 1. Of course, this doesn't cover everything, so you may want to modify the format to suit your specific needs. A good cell lead is flexible and always prepared to handle those mission changes and problems that usually arise; however, the other crews in the cell must be ready to assume the position of lead at any time.

While at the Biggs Tanker Task Force, each and every sortie taxied and launched under radio silent procedures, simulating what would probably happen at a forward operating location. The procedures that were used

Cont'd on page 14





Gallant Eagle 84

... A Buff Crew's View

Crew R-45, 23 Bomb Sq, Minot

From the frying pan into the fire. Less than two weeks after finishing our ORI, we jumped into Gallant Eagle 84. This massive U.S. Central Command sponsored exercise was designed to provide a realistic training environment for air, land, and naval forces. The primary objectives of this contingency operation were to provide joint force training and exercise USCENTAF command and control through the Tactical Air Control Center (TACC) and airborne command element. In addition, it would demonstrate the effectiveness of logistics support, joint command, control, communication, and countermeasures (C3CM) and the special information system.

The 57th Air Division HQ, Minot AFB, North Dakota, provided SAC's heavy bombardment forces. They used 14 B-52Hs from Ellsworth AFB, SD, to deploy and operate from Biggs AAF, TX, and 14 additional B-52Hs which launched and recovered from Minot AFB, ND. Each base launched 11 sorties per day for eight straight days from 4 to 12 September. From Minot, we delivered inert MK82 Snakeye (high drag) munitions on the Red Flag and Utah Test and Training Range (UTTR) in the southwest U.S. Maintenance and staff personnel worked 12 hour shifts during the entire eight day employment phase. Their well organized and timely support was crucial to our effective results. The air operations challenged bomber aircrews with the need to maintain precise timing at night in mountainous terrain while encountering air and ground based threats, while deployed tanker forces were heavily tasked to support this massive joint exercise.

There is increasing emphasis on contingency operations, and yet we perform relatively few conventional missions in our day to day training environment. Gallant Eagle 84 greatly improved the 5th Bomb Wing's ability to employ aircraft efficiently over an extended period of time. The purpose of this article is to share our experiences and lessons learned.

Mission Profile

Sortie length averaged six to seven hours with low level taking about half that time. After one day of extensive mission planning, crews arrived three hours prior to launch for specialized briefings and any changes to the prebriefed targets. Ground and engine running spares were positioned each night in case of primary aircraft ground aborts. A launch minus 20 minute taxi schedule further improved aircraft position and facilitated any last minute maintenance. Once we reached this time, all crews were prepared for immediate engine start and taxi to fill a position vacated in the stream.

Sorties launched in five minute intervals on the altitude reservation (ALTRAV) flight plan and maintained this spacing through low level. The two hour cruise prior to low level entry was ample for the offensive avionics system (OAS) programming, checklists and any needed timing adjustments. The low level navigation plan provided more than enough OAS update points to maintain the reliability of even a degraded system. Night clearance planes of 500 and 800 feet were used for terrain avoidance in the mountainous areas of the southwestern U.S. Most helpful was a full moon that provided excellent illumination of the rugged terrain throughout the exercise. Enroute and bomb run airspeeds were flown according to plan with each airplane releasing three inert weapons from the bottom three positions of the aft cluster rack. After planned release, aircraft interval was maintained throughout climbout and cruise to the IAF where the ALTRAV was closed by the last crew in the stream.

Having given you an overview and mission profile of Gallant Eagle 84, we would like to comment on what we thought were the highlights of this challenging exercise from a "Buff crew's view."

Mission Planning

The initial planning for the exercise involved a great deal of time and coordination between bomb wing current operations, bombing and navigation, and squadron personnel. Mission planning was not your normal day to day preparation. The day started with an overview of the eight days activities, the commander's comments, and then off to the specialized briefings for each crew position. Here, we got down to the real "nuts and bolts" of the specific sorties. It was much like the briefings received prior to certifying the ORI. We went over glitches in the low level route, evaluated terrain features, did target study, discussed potential air and ground threats, and reviewed aborts, recoveries, and hung bomb procedures. Abort may not seem like much, but it could be very tense if all 11 bombers were to abort the low level route within 55 minutes due to weather.

Cont'd on Page 18

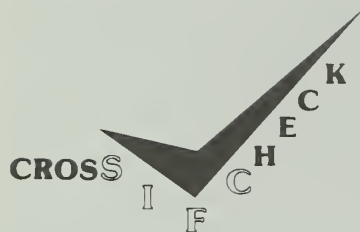
The time has come to talk of many things . . . specifically Change 3 to AFM 51-37. Because of the questions we've received on what some of the changes really mean, we've dedicated this article to the more important changes which affect our instrument flying. All the quoted (" ") portions below come directly from AFM 51-37, followed by explanations of their application.

AREA NAVIGATION (RNAV), Par 1-32b(4). [pg 1-26]: "RNAV approaches have not been adopted for use by USAF and should not be flown." As RNAV has not been approved for SAC's aircrafts enroute use (SIFC **Combat Crew** article, Dec '84), using RNAV procedures for approaches is out of the question! But the **navicators** can use the published coordinates for position orientation during approaches. This should be encouraged

when the navigator doesn't have any other course guidance available (like B-52 navigators). But remember, the pilot's course guidance is the primary means of flying the approach, the RNAV is strictly used as a backup!

PLANNING THE APPROACH, Par 3-4a(3)(a). [pg 3-5]: Referring to the name and the navigational equipment needed to fly an approach, the new change reads, "A slash (/) indicates that more than one type of equipment may be required to execute the final approach; e.g., VOR/DME, ILS/DME, etc." Before the change, the three words we've underlined were "must be used". This meant (by the strictest book interpretation) that without DME, the approaches in figure 1 could not be flown.

Now you can fly any of the finals in figure 1 without DME. (For the VOR, you can identify the FAF crossing over the VORTAC, and time to the MAP.



AFM 51-37, CHANGE 3



The same is true of the Localizer, but you must retune the LOC frequency immediately after VORTAC passage for final course guidance. And for the ILS, begin descent upon intercepting the glide path, and go missed approach at DH.) With the change to "may be required", pilots must evaluate every approach to determine the NAVAIDS needed to safely fly the final approach.

INSTRUMENT COCKPIT CHECK, 4-1m(6), NOTE [pg 4-2]): Change 3 recognizes the TACAN self test stating, "If the TACAN set self test function checks within the aircraft's flight manual tolerances and the TACAN station identifier is received, the ground check requirements of m above are satisfied." This should save a little work at the end of the runway or wherever your designated ground check-point is located.

STANDARD INSTRUMENT DEPARTURES, Par 4-7 [pg 4-3]: A new statement was added . . . "Lead points may be used for turns to and from DR legs to maintain depicted ground track." This statement would have been better if, instead of saying "May be used", had said "should be used". The pilot who is smart enough to use lead points is going to adhere to the published routing better than a pilot who doesn't use proper lead points, whether it be for DR legs or NAVAID courses.

HOLDING, Par 5-3 NOTE, [pg 5-1]: From common sense, "Do not hold directly over a VORTAC or TACAN facility if the aircraft is TACAN only equipped." This, of course, is due to the cone of confusion associated with the TACAN. By the way, did you know the cone is 15NM wide at 40,000 ft? There's trivia for you!!!

ENROUTE DESCENTS, Par 6-1a [pg 6-1]: Change 3 reflects ATC's ideas on enroute descents and lost communications.

When you request an enroute descent, "Request an enroute descent to a specific final approach," not to a specific FAF. This is more practical because some approaches do not have FAFs, and even if there is a FAF, you really want to be vectored onto final prior to the FAF. So requesting a type of final is better all the way around.

As for lost communications, "If the requested enroute descent is to a radar

final, select a backup approach that is compatible with existing weather and aircraft equipment. If you experience lost communications, you are automatically cleared to fly any published approach." These sentences contain two important points:

1) Do not bother ATC with our [AF pilots] eternal fear of lost comm! You need only select a backup approach for

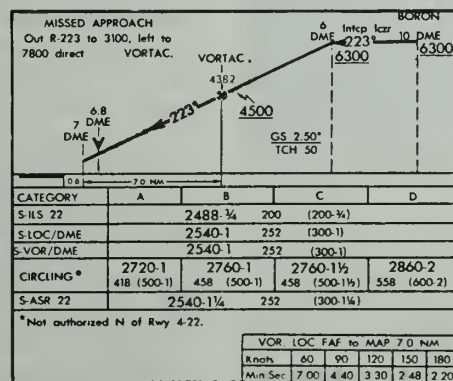
"We've dedicated this article to the more important changes which affect our instrument flying."

the radar final and inform the crew, not ATC (as they never cared)! This is proved by point two.

2) If the dreaded "lost comm" should strike, fly the published approach you think best, you are automatically cleared for all of the approaches at the airport you received your enroute descent to. Also, "automatically cleared to fly any published approach" means you penetrate immediately. **DO NOT USE UP VALUABLE AIRSPACE WORKING ON A NON-EXISTENT ETE OR EFC TIME!!!**

PROCEDURE TURNS, Par 6-11 [pg 6-8]: This is where majority of insert pages went. What do they cover? The way other military and civilian pilots have been flying low altitude procedures for years, and ICAO course reversals.

Par 6-11a no longer tells us to "Disregard the . . . barb symbol" on procedure turns, implying the barb may be used as the rest of the flying world



VOR/DME or ILS/DME RWY 22

uses it. But Par 6-11f(1) tells you that if you want to fly the procedure using the barb, "The aircraft's entry heading must be within $\pm 30^\circ$ of the outbound track prior to crossing the procedure turn fix." This makes the entire idea of using the barb unnecessary because if you are within 30° of the outbound course, you'd probably teardrop the entry! If you have questions on the new "optional" procedures, talk to your unit SIFC graduate, he'll be able to explain how to use the procedures.

Par 6-13.1. discusses the ICAO course reversal maneuvers. There is just too much information to be properly covered in this article, so we suggest you read this information for yourself. After you've read it over, talk to one of our graduates, or call us, if you have any questions.

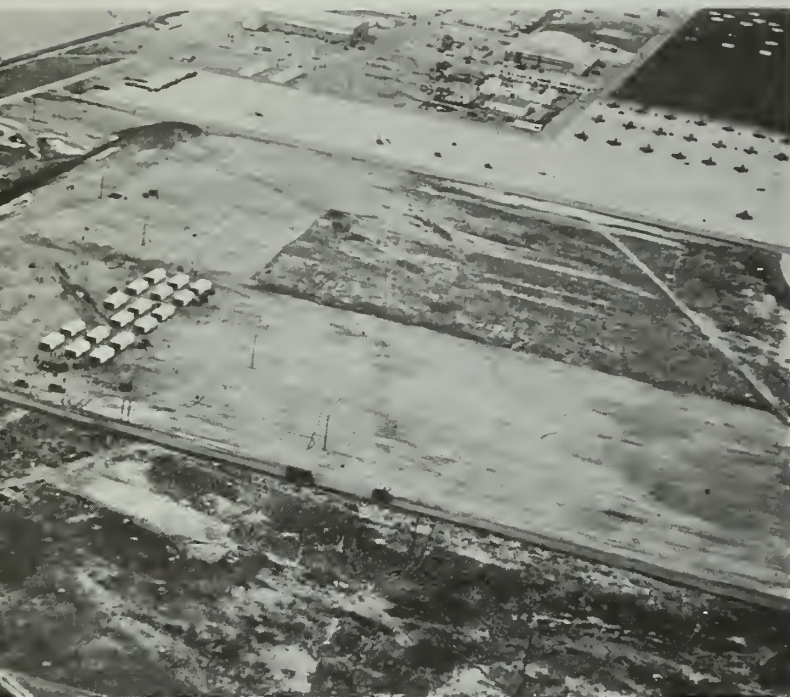
NONRADAR FINAL APPROACHES, Par 6-16a(h) NOTE, [pg 6-14.4]: "When fixes on the IAP are depicted as formed by radar, only ground based radar . . . may be used to position the aircraft." In other words, onboard radar equipment is not to be used to fly published approaches. The reason for this is because there are just too many different kinds of aircraft radars, each with different tolerances, to be considered in approach development. So the Air Force has elected, quite wisely, to restrict all airborne radars for approach use. Only ground based radars will be used in approach design.

AIRCRAFT SURGE LAUNCH AND RECOVERY (ASLAR), [pg 8-5]: This is primarily a TAC concept, but SAC is experimenting with it. The idea is to launch and recover as many aircraft as possible in as short a time as possible. When, and if, ASLAR is adopted as a procedure by SAC, rest assured additional guidance will be made available.

That's a quick recap of Change 3 to AFM 51-37. We didn't cover everything, only the high points and items which we've received calls over. We hope you will look at the low altitude procedures for yourself. It requires a little self-study to fully understand. And as always, if you have any instrument questions, talk to your unit SIFC graduate, or call SIFC. We're all available to share our instrument knowledge.

GALLANT EAGLE 84

Cont'd from page 10



Aerials of Bare Eagle Base under construction and completed.



were based on the Silent Warrior program developed by the recent winners of the Spaatz Trophy (for the Best Air Refueling Squadron in SAC), the 906 AREFS at Minot AFB. Crews started engines, taxied, and launched at prebriefed times. Under these constraints, a clear and understandable taxi plan was a necessity. Tower periodically would broadcast the current takeoff

conditions. Last chance inspections were performed by Foxtrot using visual signals. Five minutes prior to takeoff. Tower broadcast ATC flight clearances in the blind. A rolling spare aircraft was used to cover any maintenance problems, while water trucks and maintenance crews were prepositioned for any ground aborts.

One of the more impressive aspects of Gallant Eagle was the fact that the crews consistently took off "on the hock." Our squadron commander, who was also the Task Force Commander, put his career on the line when he sat out on the hammerhead with one of the many visiting generals. The general was told he could set his watch on the takeoff times, and sure enough, he did!

After unsuccessfully negotiating with Air Traffic Control for clearance to launch a five ship cell formation, or for airspace to rejoin the separate aircraft on departure, an elaborate departure and join up plan was formulated by the resourceful TTF staff. Takeoffs were at intervals of up to five minutes. It was important to know and understand the departure routing because of the rising cumulo-granite (the mountains usually climbed faster than we could), and the special join up timing and airspeed schedules. The weather gods were cooperative in that all our departure weather was VMC. However, both SACR 55-11 and the Air Refueling Procedures manual (-3) give specifics on how to ensure safe formation join up and enroute cruise in both VMC and IMC. Proper use of radar, nav aids, and radios gave us countless ways to get formed up when necessary. Again, the procedures to be used were briefed by lead must be known cold by every player.

During the first few days, one of the more noticeable problems involved staying in position. The importance of maintaining proper position off lead was graphically illustrated. The accordion effect is real, especially when you are #5. Having both the nav's and copilot's radars set up properly, even when it's clear and a million can really help. The use of the autopilot heading select works well. Get a heading check from lead enroute, and note the difference between his N-1 compass and yours. Apply this correction to every heading change, while trying to avoid small heading changes, or snaking, unless necessary. A good lead is always on speed and considers the airspeed requirements of the top airplane in the cell. Remember to maintain the same true airspeed by subtracting three knots indicated airspeed as you go up every 500 feet in altitude. When stabilized, note your airspeed indicator differences for future use. Lead can help by giving the cell his EPR settings. Another interesting technique that works well only if everyone is in position and on speed is the use of mach hold for climbs and descents. For climbs, lead calls setting "normal" or "military" power with the preparatory and command of execution calls. He then calls engaging mach hold in the same manner. For descents, lead calls for 2000 pounds fuel flow on all engines. After this he calls for mach hold. If everyone is in position and on speed, it works out great.

Another perpetual problem is radios. Wilbur and Orville Wright were probably the only fliers that didn't have this problem! Everyone knows that excess chatter

is annoying, unprofessional, and sometimes outright dangerous. This includes interphone as well as UHF and HF. An effective technique we used for frequency changes and acknowledgements was that the cell members would acknowledge (using cell position) in sequential order only after the previous aircraft had done so. If, for example, #3 didn't answer, neither would #4 or #5. Therefore, you would know that #3 either had radio failure, or the crew was asleep. Monitoring the properly briefed HF frequency also helps.

When preparing for refueling, especially in an anchor area, get clearance to enter and refuel ASAP. Check with the controlling agency for the status of the receivers, and ask for a head's up call when they are inbound. If any time delays are expected, slow to endurance airspeed to conserve gas. Again, remember the airspeed requirements of the top airplane, especially when you are heavy and slow. It is essential that lead hold the proper airspeed during the orbit. For heading changes lead should give preparatory and command of execution calls. It may also be necessary to brief and use 25 degrees of bank in the orbit, in order to stay in the area.

During the rendezvous with the receivers and during refueling, the cell leader and booms with receivers should be the only ones talking on the air refueling frequency. All calls should be clear and concise. In a formation, it is vitally important to know your position and stay there. Lead should be aggressive. Know what you want and when you want it. For anchor orbits echelon 5-10 degrees right, and remember turns into an echelon are limited to 15 degrees of bank. Lead should direct each receiver to a specific tanker, based upon the fuel status of everyone involved. For large offloads, it really makes things easier if you preplan your fuel management sequence. It could be embarrassing landing with a 35% CG. If possible, the last cell members should bingo out first, leaving lead as the last tanker on station. It is helpful to have the last cell member initiate offload reports and his fuel status to lead using bingo-plus when he sees there are no receivers currently refueling on any tanker in the cell.

When the first airplane gets close to end air refueling, give the appropriate ATC agency a heads up call for the clearance home. Also let ATC know that there are other aircraft that will soon need their clearances too. This can be the most confusing part of the mission. As each airplane bingos out, don't start the climb until the cell is in position. If possible, maintain visual sighting on the other aircraft until well clear, and maintain a constant climb airspeed or mach. Make sure lead knows you are departing. If the cell ends air refueling together, and returns home in formation, you will have to break up the cell before landing. Long delays in acquiring separation can result in delays and/or extensive vectoring during recovery. The type of cell break up should be prebriefed. You can use altitude separation, separate routings, cruise at differential airspeeds, or stack up at a holding fix and penetrate using differential airspeeds. When you are back on the ground with a cold beer in your hand, make sure to let your comments about the mission be known at the cell debrief. Be diplomatic,

but don't be shy. This when some of the best learning occurs. Debriefing must be thorough, comprehensive, and full of feedback.

Cell formation flying can be one of the most challenging and enjoyable experiences during your career.



Five F-16 Fighting Falcon aircraft and a KC-135 Stratotanker aircraft are silhouetted against the sun during an aerial refueling operation.



Air-to-air right side view of F-4 Phantom II aircraft as refueling operations with a KC-135 Stratotanker take place during Exercise Gallant Eagle.

Since we don't do much of it in SAC, take advantage of every opportunity that comes your way. Before you know it, you will be telling war stories and passing on techniques with the best of them, just like the old crusty crew dog we all know, who probably started his flying with Wilbur and Orville.



REFLECTIONS ON A TEN YEAR REUNION



Captain Richard James
4315 CCTS
Vandenberg AFB, CA

As I walked in the front door, I picked up the day's mail and began leafing through it. The return address on a brown envelope made my heart skip a beat. Kingman, Arizona — my old hometown. Even though my parents had moved from Kingman, it was the place I had grown up. I had gone to elementary school, junior high, and high school there; in short, it was home. Opening the envelope, I saw a letter and a questionnaire. It was time for my 10 year high school reunion! Could 10 years have passed? A quick calculation revealed that it had indeed been 10 years. As I read through the letter, old memories came flooding back. Football games, classes, practical jokes, and of course, those cool Arizona nights up on Inspiration Point with the old girl friends. I began to be filled with a great sense of anticipation; what would everyone be like, had the old friends and old haunts changed? All of a sudden, I could hardly wait.

Months went by, the reunion was forgotten until the day I received a letter from the prettiest girl in the class,

reminding me to fill out my questionnaire and return it. Once more I was instantly excited about the reunion. I found my questionnaire and began to answer the questions. The first question was, "What have you been doing for the last 10 years?" For me it was four years of college and then six years of Air Force. Then I reached question number six, "Tell about your work." The excitement and thrill left me as suddenly as it had come. What could my classmates think about my job as a captain in the Air Force? Would they be impressed? Would they consider me a warmonger? How would my career compete with theirs? Would they all be Nobel prize winners? As I began to summarize my career on the questionnaire, more questions entered my mind. You see, the first four years of my Air Force career I had spent assigned to the 341st Strategic Missile Wing, Malmstrom AFB, Montana, as a missile combat crew member. During those years, I pulled 239 alerts. While on those alerts, I had been responsible for 10 Minuteman Intercontinental Ballistic Missiles. I had held the

keys that could unleash the horrors of nuclear war. What would my classmates think of that? To them, would I be a keeper of the peace or a militant warmonger? I grew concerned. What would they think of my current job? For the last two years I have been an ICBM Operations Instructor assigned to the 4315th Combat Crew Training Squadron at Vandenberg AFB, California. My job has been to train crew members for our missile combat crews. I agonized over whether or not I should attend and if I did, should I tell the truth? I considered telling them I was an F-15 pilot, after all, who would know the difference? At last, common sense and pride prevailed and I decided to attend and fill out the questionnaire honestly.

After sending in the questionnaire, time seemed to fly. July was upon me and it was time to journey back to Kingman for the reunion. At the first event, I walked in the door and was greeted by another of the best looking girls in the class; I never could decide who was the prettiest. She seemed friendly enough, no warmonger sentiments there, I thought as I walked away. I decided that even though I definitely was not ashamed of my job, I was unsure how people would react, so I thought I would just keep a low profile. That strategy worked fine until the evening of the second day when the banquet was held. After we had eaten, the class gave awards. There were the usual — most changed, least changed, most children, etc. Then the master of ceremonies said, "And now the award for the most unusual occupation." My heart sank. His next words were "The winner is Rick James, who is in charge of launching nuclear missiles." (A gross oversimplification of my old job.) There goes the low profile strategy I thought to myself as I walked to the podium. When the prize turned out to be a model of an F-16, I didn't have the heart to tell my classmates that giving an airplane to a missileer is not very appropriate. My classmates clapped and reacted warmly.

After the formal part of the banquet was over, I was surprised by the number of people curious about my job. I answered their questions as best I could and tried to help them understand what we missileers are all about. As we talked, I wished that I could put into words the terror one feels during a 3901st Strategic Missile Evaluation Squadron standboard, or the boredom experienced in a Minuteman Launch Control Center at 2 a.m., or the mixed emotions an advanced state of readiness brings. No, I couldn't put these feelings into words. The one thing that I tried the hardest to convey is that I had been a keeper of the peace, that I had stood watch, and that I was proud beyond words that I was a missileer and a captain in the United States Air Force. While my classmates had gone to college, had babies, pursued careers, and all the other things Americans do, I had kept watch. Did I get any of these things across? I don't know; so many of the things I spoke of one has to experience to understand. I feel I made some impression, because as we left, a classmate approached me. "Is that really what you do, Rick?" she asked. I replied that it was. As she headed for the door, she called back

over her shoulder in a half serious, half joking tone, "You keep us safe now." I replied, "I have and my students will continue to."

The rest of the reunion events passed quickly and before I realized what was happening, it was over. As I drove back to Vandenberg, I pondered the events. The reunion had been a lot of fun but the best thing about that weekend was what I learned about myself.

First of all, and most importantly, the significance of my Air Force career became clear to me. Some of my classmates made more money than I do and some made less. Some had what would be considered prestigious jobs and some do not. Some had just as much education as I and some had less. When I began to compare my Air Force career with those other careers, I realized that there was no one there that I would trade places with. I was different and I feel that many of my classmates recognized that.

Second, I learned that we in the Air Force tend to be clannish at times and we fail to realize that what we do is special. From time to time we need to get away from the base, away from the towns around the base, and out among people with no connection to the military whatsoever. When we talk with these people, we realize the uniqueness of what we do.

Third, I learned that even though nuclear weapons may not be immensely popular, the average guy in the street appreciates what we do. As I talked with my classmates, I believe in some I saw respect and admiration in their eyes. I truly believe that they were thankful for the sacrifices I have made and were comforted to know that even as we spoke, the keepers of the peace were out there on watch. Even though my watch ended on July 20, 1982, I still feel proud of those 239 alerts. I also feel proud that students I have trained are now keeping the watch.

Yes, it was an interesting reunion. If you're ever by the 4315 CCTS, you'll know my desk. It will be the only one with a model of an F-16 on it. I put it there so that every time I feel discouraged, unrecognized, or even when a curious student asks about it, I'll be reminded that what I do is special and appreciated. By the way, the girls in my class are still good-looking.



Captain Richard James is currently the Operations Flight Chief for the ILCS section of the 4315 CCTS, Vandenberg AFB CA.



After the specialized brief, we were handed the mission folders for the sorties we were to fly. Most of the necessary paperwork had been completed, so all we had to do was check it for accuracy, insert necessary changes, and study the material.

Believe it or not, the ground operations required a great deal of coordination. It sometimes seemed that ground ops were more complicated than airborne ops. Questions like, "Where do I go if I break while taxiing?" or "What's my call sign if Two is canceled. Seven has a 15 minute fix time, and the ground spare has already taxied?" With 13 crews and airplanes on the ramp to launch 11 sorties in a short amount of time, radio communications were critical. Planning required crewmembers to pay special attention to every detail throughout the mission. If they did what they weren't supposed to, or didn't do the required actions at the right time, it made life tough for everyone. Therefore, we can't stress enough the importance of mission planning. Reason? Those brief moments may have been your only chance

Biggs Army Airfield, TX . . . Aerial view of a B-52H Stratofortress aircraft parked in a hot-bladder pit refueling site during Exercise Gallant Eagle.



to think things over before you saw it in the air.
Night Mountainous Terrain Avoidance

Because of continuing safety concerns about night mountainous terrain avoidance (TA), we were very careful about our TA operational checks. The TA check areas were designated by bombing and navigation staff and carefully briefed. The check areas were very short and frequently required more than one area to fully accomplish the compensation. In a real world situation, crews would probably want to reevaluate their TA system several times, especially when the low level is several hours long.

The other TA emphasis area centered around the question, "How do we get a reliable TA profile trace for the pilots so that we can descend out of IFR altitudes for the TA altitude?" For instance, we've just hit a TA area, or crossed a high ridgeline and the pilot's profile trace is anomalous. To expand our TA "bubble" (the area covered by the TA radar) and get an accurate trace for descent, we tried several things. First, we increased the range of the radar returns out to six or ten miles. Then we increased the clearance plane down to the tech order limits for the respective radar range. We then began to pick up a reliable trace for descent, the radar navigator started advising the crew of high terrain and distance, while the navigator stated the terrain elevation. By working the clearance plane back down to our original setting during the descent, we were able to maintain a reliable terrain trace throughout the descent from the IFR altitude. With this type of system performance and diligent crew coordination, we were confident of our terrain clearance and our ability to fly the briefed low level altitudes.

Electro-Optical Viewing System (EVS)

Preflight briefing specifically prohibited weapons release unless we acquired the target visually or in the EVS. Therefore, we were all anxious to see if, when, and how we would pick up the target. The weather shop had provided us with the EVS illumination forecast, their prediction on whether the aircraft's steerable low light TV (STV) or the forward looking infrared camera (FLIR) would give the better picture.

Upon arrival in the target area the weather was fantastic with unrestricted visibility and a bright moon. Its illumination provided us with a strong sense of confidence. We were generally picking up the target at about 30 seconds visually, followed shortly thereafter by EVS identification. FLIR acquisition depended on whether the target area was cultural or terrain. Real runways provided a much better contrast than graded earth revetments. The prevailing moonlight normally made the STV the better of the two sensors and provided the best picture to the navigation team for visual target identification.

Regardless of the means of target identification, all were concerned with one fact. There was very little time to visually confirm precise target location and make heading corrections. Even under the ideal night conditions we had, we were bombing almost exclusively off radar. Visual identification was only a back up for the radar to keep us from making gross errors. It certainly would have been challenging to do accurate visual bombing under these conditions.

Defense

Though considerable time was given to planning for airborne and ground threats, a combination of weather and site capability precluded most ECM activity. Those sorties penetrating low level at the China Lake and Red Flag ranges were rewarded with a variety of simulated threats, both air and ground. The threat scenario provided a welcome change from the routine training missions. However, timing criteria prevented active evasive maneuvers, so we were relegated to simulated actions. In the future, we hope to see a greater emphasis on

COMBAT CREW

threat activity in respect to both timing criteria and site capability.

Communications

While only a few sorties encountered fighter attacks, aircraft gunners were kept busy in the communications realm. Gallant Eagle was a proving ground for AFSATCOM. With the AFSATCOM terminal we were able to communicate with command post at all times during the mission, which is not always possible with HF and UHF radios. We used AFSATCOM for ops reports, low level weather, target changes, maintenance brevity codes, and even interplane communications. Best of all, it provided us with a hard copy of all messages.

Bombing

Bomb runs were a coordinated effort between crewmembers. We updated times and headings, cross-checked visual cues, and cleaned up release checklists. During Gallant Eagle we emphasized the use of terrain features for offset aiming points (OAPs). Many SAC training routes depend on cultural returns for offset aiming, so this exercise gave us valuable experience with terrain offsets. Feedback from other crews, as well as scores after the first night, helped us refine our aiming techniques to improve our weapons scores on subsequent missions.

The pilots helped during the bombing by "ADFing the FCI." If the drift was less than three degrees, the ADF technique allowed them to line up visually and ensured the axis of attack was very close to, if not exactly as planned. If we did not approach the target along the planned axis, the radar signature of the terrain OAPs would change. Because we were on planned axis it allowed the radar navigator to place the radar crosshairs more accurately. This made it particularly important that the heading be exact during the short bomb runs between the IP and the target.

Gallant Eagle tasked us with bombing specific targets instead of "area" targets. By adjusting the bomb release interval control unit, the interval in feet between bombs, the train length was decreased so we could concentrate our weapon drop on certain points. This compensation would succeed as long as heading and groundspeed were flown as planned. We compared the damage expectancy of our three bomb drop with that of a full complement of MK82s. The scores proved beyond a shadow of doubt that a train of weapons would achieve target destruction.

Another important variable we had to consider was weapons release with the aircraft in a bank. It was possible to be in a bank because some of the bomb runs involved a turn from the IP to the target. Also, since the pilots were trying to attack along a certain axis they might be making small turns prior to weapons release. In real world scenario, the aircraft might be in a turn in an effort to avoid air or ground threats. The question then was, how would a turn shortly before or during weapons release effect bombing accuracy? We found our answer in the bomb ballistic tables. Our conclusion: For low altitude releases the error is insignificant, whereas at high altitudes even a small bank would induce a large error.

FEBRUARY 1985



Biggs Army Airfield, TX a B-52H Stratofortress aircraft landing with a rear drag chute deployed during Exercise Gallant Eagle.

Another bombing method which deserves further investigation in the contingency operation is Busy Bulls-eye. Busy Bullseye uses EVS aiming for target acquisition and countdown to release. This technique requires a predetermined altitude and groundspeed which must be adhered to for accurate delivery of ordnance. Its drawback is that every foot of altitude error will result in seven feet of bombing error. This method is obviously not tailor made for terrain avoidance flying because of changing altitudes and airspeeds. Also, you must be able to see the target since the bomb run starts with acquisition of the target in the EVS. Although we did not use this technique, it's important to note that in a different contingency environment, Busy Bullseye might be a valuable bombing aid.

Overall, Gallant Eagle 84 was very realistic training. If we were ever to become involved in a conventional conflict, this is how we envisioned it: Receive the mission folders, study the routes and target, fly the sorties, deliver the iron, recover, and do it all again the next day. That was Gallant Eagle 84.

Crew R-45, BMS, Back row, L to R, FP Capt Sam J. Kendrick, NB 1Lt John J. Slavoski, NE 1Lt Joe P. Lacy, Front row, L to R, CP Capt Mark E. Madison, NN 1Lt Daniel R. Clevenger, AG SSgt Scott T. Smith.





Major Hugh E. Smith
Central Flight Instructor Course
Castle AFB, CA 95342

THOSE INTERRELATED AERODYNAMIC EFFECTS

Editor's note — This CFIC article appeared in Combat Crew several years ago, but the information it presents is just as critical today as it was then.

Those of us who periodically pass gas inflight have all been told that "it is unsafe to fly two aircraft in close vertical proximity because of the magnitude of interrelated aerodynamic effects." Well, that's neat to know, but some further discussion might also be neat. The above warning can't help but elicit more questions. Such as, "What effects"? and "How much magnitude?" Well, let's look at what happens to the airflow around two aircraft during air refueling, and then look at what these "interrelated effects" mean to us as pilots. Then we'll look at some all too common situations.

UPWASH, DOWNWASH, BERNOULLI

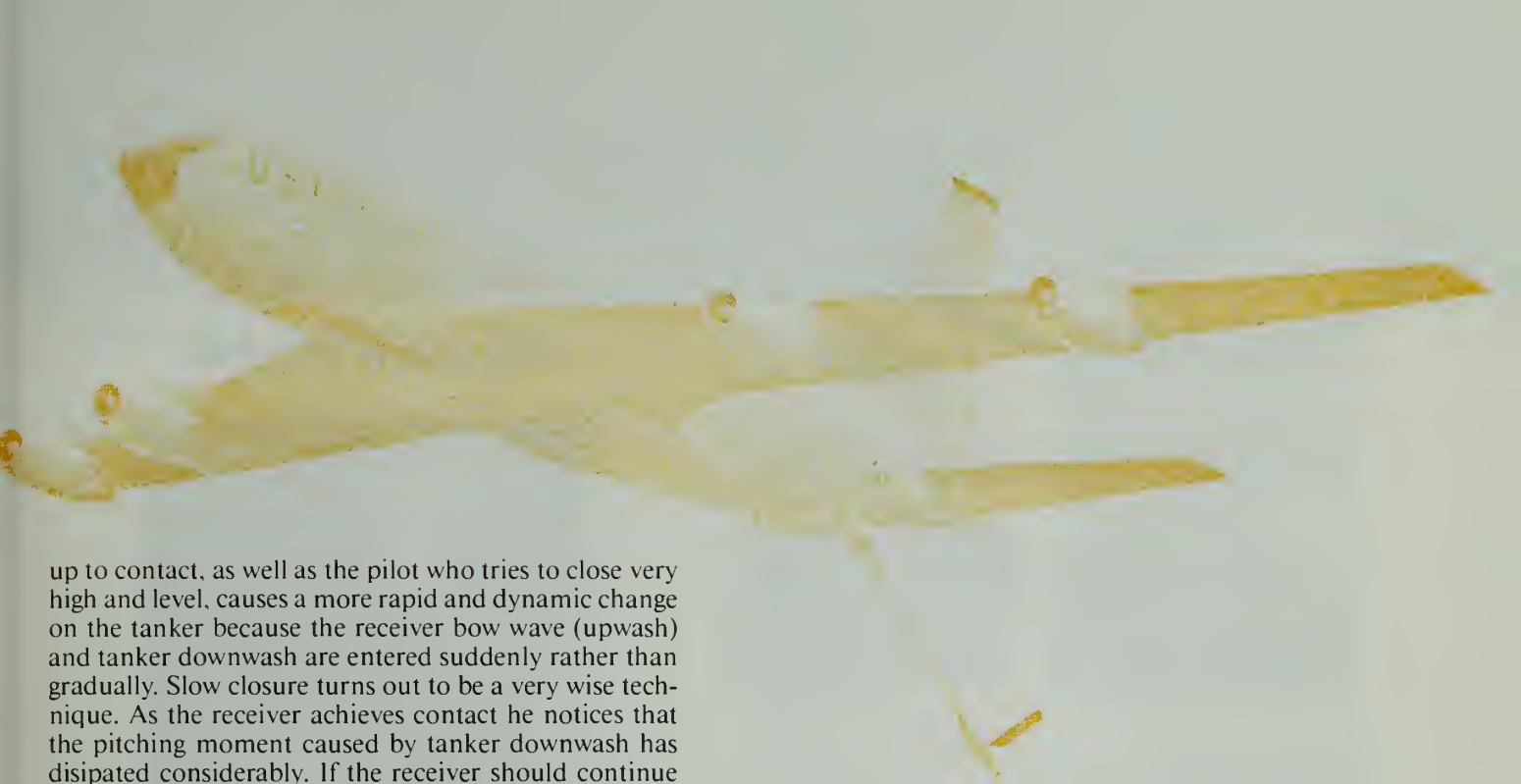
To understand what's happening during air refueling we need to understand a little about upwash, downwash, tip vortices, and some of old Hormel Bernoulli's theory about pressure differentials. As an aircraft produces lift it affects the airflow around it. Relatively speaking, the airflow produces an upwash ahead of the aircraft and a significant downwash behind it. Remember last summer when you were whistling down the highway toward your favorite bistro and you noticed a butterfly about to become a hood ornament on your car? You were concerned momentarily about your fresh wax job, but that young butterfly was mysteriously lifted over your car. If you had looked in your rearview mirror you would have noticed said butterfly, on the outer edges of maneuvering flight, as he was suddenly returned to his original altitude. What caused this phenomenon? Your car was actually acting as an airfoil. The airflow directly in front of your car was directed upwards and back creating upwash. Additionally as the airflow passed over the rear of the car downwash returned the butterfly to his original altitude. When a wing produces lift, we all know that a pressure differential exists between the upper and lower surfaces. At the wing tip this pressure differential creates components of spanwise air flow. On most SAC aircraft the

lateral flow developed at the tip is quite strong and a rather strong vortex is created. For conditions of positive lift, this vortex has a twisting component toward the aircraft centerline as it moves relatively down and aft of the wing. According to Bernoulli the above mentioned pressure differential is due to the velocity differential above and below the wing. By now you're thinking "all this is really fine but how does it affect air refueling?"

NORMAL CLOSURE

Consider first the normal air refueling closure from precontact to contact. We all know what happens to our airplanes, but why does it happen. Ask any tanker driver why his airplane is affected and he will tell you "Receiver bow-wave (upwash)", and he is right! Partially. Ask any receiver pilot why his airplane is affected and he will tell you "Tanker down wash". He is also right, partially. Some of you "Christine" 135 drivers who are AC/DC may be feeling left out, but you folks probably have the *most* correct answer . . . "It depends". Actually, as two aircraft come in close vertical proximity, the upwash, downwash, and to a lesser extent the tip vortices of both airplanes are affected. From the tanker view point, a receiver closing to the contact position causes a change in the vertical component of the upwash and downwash which is not unlike ground effect. The tanker wants to pitch down as it does when entering ground effect (nose-up trim is required.) Induced angle of attack is reduced just as it is in ground effect (thrust required is reduced). In fact it has been shown that in some conditions of flight (climb for example) the increased parasite drag of boom extension is more than compensated for by the reduction in induced drag due to the receiver in contact, causing "ground effect".

From the receiver point of view, tanker downwash causes the airplane to want to pitch down and slow its rate of closure. The magnitude of these effects depends primarily on the rate of change of the upwash and downwash on both airplanes. This rate of change depends on the speed and relative angle that the receiver takes. The receiver closing very rapidly will obviously have a more rapid and dynamic affect on the tanker. The receiver who closes very low and then tries to pop



up to contact, as well as the pilot who tries to close very high and level, causes a more rapid and dynamic change on the tanker because the receiver bow wave (upwash) and tanker downwash are entered suddenly rather than gradually. Slow closure turns out to be a very wise technique. As the receiver achieves contact he notices that the pitching moment caused by tanker downwash has dissipated considerably. If the receiver should continue on beneath the tanker he will notice the pitching moment begin to increase again, only this time in the *NOSE UP* direction!

CENTERLINE UNDER RUN

If the receiver continues to underrun the tanker, the downwash will move aft causing the receiver to begin to *pitch up*. If the underrun condition develops to the point where the downwash strikes the empennage, elevator authority may be insufficient to counteract the pitch up. Pitch up by the receiver is but one of the characteristics of a centerline underrun. Additionally, the tanker begins to exhibit more and more of a pitch down tendency, (similar to ground effect.) Wonder why? As the airflow accelerates between the two aircraft, (Venturi said it would), the pressure in this area will decrease (remember Bernoulli?). This low pressure will attract both aircraft (increased lift on the underrunning receiver, decreased on the tanker above). If the tanker autopilot is engaged, it may sense this low pressure as a climb and induce even more nose down pitch. B-52 pilots should remember that lowering the landing gear can be an exceptionally fine idea when a center line under run appears eminent.

LATERAL UNDER RUN

Let's consider next what would happen if the receiver noticed a center line under run developing and attempted to offset himself to one side. If a turn is attempted too late, say after the receiver enters the area of tanker down wash, it will be very difficult to affect a turn at all. If the receiver has one wing affected by downwash and the other not, the receiver aircraft will want to roll toward the tanker centerline. You can feel these pressures by attempting to line up on an outboard engine during your next refueling.

If the closure angle and rate are of sufficient magnitude to allow a lateral underrun, the same principles

apply as during the center line underrun. The overlapping wings cause airflow to accelerate (Venturi again), the increased air velocity causes a decrease in pressure (Yep, old Bernoulli). Low pressure between the two wings will cause them to attract, resulting in a tendency of the tanker to roll toward the receiver, and the receiver to roll away from the tanker (Tanker affected wing will drop, receiver affected wing will rise). The result can be just as dramatic as a center line underrun.

BREAK AWAY

A properly executed break away (anybody can initiate one) is a good remedy for conditions leading to the above situations. However, an improperly executed break away may serve only to compound the problem. Remember, separation is the objective! Tank drivers, don't be in a big hurry to increase your pitch attitude, increased pitch can lower your tail and decay airspeed. Receiver drivers, don't be in a big hurry to stuff the nose over. Your tail can come up, and even with the power at idle, airspeed can increase. Booms, make sure your "Cleared to climb" call is not automatic, and if the old Ace climbs early you might tactfully place both quick-dons on his name tag while you explain the situation.

Although it is really not that important to know that Venturi and Bernoulli developed these theories, an understanding of the principles involved can help us to recognize a potentially hazardous situation soon enough to recover. An understanding of these principles can also help us to visualize what Fred Boeing is talking about when he tells us that "it is unsafe to fly two aircraft in close verticle proximity because of the magnitude of interrelated aerodynamic effects".

Until next month "Fly the aircraft".





PROFESSION

Aircraft Maintenance

SSgt Dennis D. Benson, 319th BMW, Grand Forks AFB, is SAC's **Maintenance Airman of the Month**.

Assigned as an aircraft structural repairman, SSgt Benson manufactures structural components for B-52G, KC-135A and HH-1H aircraft. SSgt Benson's superior performance made him the obvious choice to oversee the establishment of a permanent phase repair crew of structural repairs. His inspired leadership resulted in the quality assurance fail rate for structural repairs dropping by two thirds, the phase crew's showing no discrepancies on work done during the past five months, and the delayed discrepancy rate for structural repairs dropping to its lowest point in seven years. His technical skills are no less impressive. SSgt Benson is the only structural repairman to receive an "outstanding" rating on a quality assurance tasks evaluation in the past three years. As shop equipment monitor, he was awarded an "outstanding" rating by SAC MSET and has maintained a record of "excellent" ratings during quality assurance equipment inspections. He recently completed his five-level certification in minimum time with an end-of-course score of 98 percent and is rapidly progressing towards his seven level.



Missile Crew



Crew R-048, consisting of 1Lt Loren H. Schrag, Jr., CMCCC, and 2Lt Steven A. Burton, DMCCC, 321 SMW, Grand Forks AFB, is SAC's **Missile Crew of the Month**.

Lts Schrag and Burton were on alert at launch control center (LCC) Delta-Zero when severe thunderstorms resulted in numerous security situations and multiple power changeovers at several flight LF's and at their LCC. Their site security personnel, responding to a security situation on LF Delta-Forty, reported that a power pole and transformer on that site were in flames. The crew quickly responded to this critical status by establishing an entry control point to restrict unauthorized access to the site. After contacting the wing command post, they requested fire fighting assistance and coordinated with job control and the local power company to isolate the site from commercial power to control the fire. Maintaining continuous communication with job control, wing command post and power company officials, the crew monitored and coordinated all actions assuring that proper site security was maintained and that all possible safety precautions were met. After the fire was controlled, the crew gathered status relative to site damage and aided in the dispatch of critical maintenance to assure all site discrepancies were corrected. Their prompt and decisive action during this emergency prevented personal injury and limited equipment damage to a multimillion dollar missile launch facility.

NAL PERFORMERS

Flying Crew

Maj Edward C. Brown, P, and Maj William M. Moran, Jr., RN, 380th BMW, Plattsburgh AFB, make up SAC's Flying Crew of the Month.

Recently, Majors Brown and Moran were scheduled for a night training sortie in a FB-111A aircraft. Pre-flight was normal through taxi and initial afterburner initiation. The only discrepancy noted by the crew during brake release and selection of zone five afterburner was a slight difference in nozzle positions. Passing through 80 knots, the crew felt that the aircraft was not accelerating normally. Since takeoff distance is rarely a factor in the FB-111A, even at maximum gross weights, there are no acceleration check speeds published for the aircraft. Maj Brown initiated an abort at 130 knots. Turning off the runway, the crew felt a slight vibration in the airframe, although all engine instruments were still normal. Smoke started to appear from the rear of the aircraft. The possibility of an engine fire existed but without instrument readings or ground crew support they were unable to isolate the source of the smoke. FB-111A tech data prohibits engine shutdown after a high speed abort until fire equipment is in place, since scavenged fuel is dumped in the vicinity of the brakes. When maintenance and fire equipment arrived at the aircraft, the crew chief signaled that the smoke was coming from the right engine. As smoke completely engulfed the aircraft, he signaled for an immediate shutdown. The crew quickly accomplished the engine fire



checklist and safely egressed the aircraft.

Investigation of the engine revealed extensive internal failure of the turbine section characterized by the destruction of several turbine blades with a massive oil loss. Had the takeoff been continued, catastrophic engine failure with a probable seizure would have occurred soon after liftoff. With existing weather conditions, aircraft configuration, and gross weight, single engine thrust available would have been critically low. Both highly qualified instructors, Majors Brown and Moran exercised superior judgment in their decision to abort. This decision certainly averted a serious airborne emergency and possibly saved a valuable aircraft. Further, their strict compliance with tech data after the abort, despite the unknown cause of the smoke enveloping the aircraft, displayed superior crew discipline and outstanding professionalism.

Missile Maintenance

SrA Robert M. Cockrell, 351st SMW, Whiteman AFB, is the SAC ICBM Maintenance Airman of the Month.

SrA Cockrell has excelled in many areas while assigned to the 351st FMMS. He attended the Bendix Corporation Emergency Rocket Communications System school, earning a 98.6 percent average and becoming one of only three Air Force members completely qualified on this intricate system. SrA Cockrell recently identified an error in the software program of the Automatic Test Equipment saving many man-hours in bringing a missile back to alert status. SrA Cockrell's personal performance has been outstanding. He has never received an unqualified grade in an evaluation and has earned the Master Technician Award. He also routinely scores 100 percent on code component handler's testing.



SrA Cockrell exemplifies the highest qualities of the most successful airmen. He has made significant contributions to the defense of our nation.

cont'd from page 7

SAC's MACH III Squadron

- Expansion joints on the aircraft which seal as the aircraft actually expands and stretches due to the air friction heating at Mach 3+ speeds.

- The absence of a compressed air system, due to the problems of expansion with heat and altitude (liquid nitrogen and JP-7 are used for component cooling and pressurization).

- An in-cockpit engine control system which allows the pilot to adjust engine trim in flight.

- Even though the SR-71 cockpits are pressurized, its crews wear full pressurization suits as an added precaution at altitudes above 50,000 feet (the suits are identical to those worn on early space shuttle flights, and are also worn by U-2/TR-1 pilots of the 9SRW).

Although the impressive tactical capabilities of the SR-71 remain classified even today, the USAF has "shed the wraps" on a few occasions to allow the ISRS to capture a number of international aviation records for the United States. Among the spectacular records set by the SR-71 are:

April 1971

— a 15,000 mile non stop mission completed in 10 1/2 hours.

September 1974

— a 1 hour, 55 minute flight from New York to London (3490 miles).

— 3 hour, 47 minute flight from London to Los Angeles (5645 miles).

July 1976

— record for speed over a 1000 km course (2092 mph).

— a record for speed in a straight line (2193 mph)

— record for sustained altitude (85,069 feet).

With a past marking over 71 years of aviation history, the 1st Squadron has flown 25 aircraft from 16 different bases around the world. Today, flying the extraordinary SR-71, the 1st proudly continues to perform in its position as the past, present, and future leader in military aviation.

SAC'S FLYING SAFETY RECORD

CLASS A FLIGHT MISHAPS

YEAR	74	75	76	77	78	79	80	81	82	83	84
TOTAL MISHAPS	8	4	4	4	1	5	4	4	2	2	3
FLYING HOURS 100,000	5.1	4.2	3.9	3.7	3.6	3.6	3.4	3.5	3.5	3.0	3.4*
FATALITIES	14	7	22	10	5	1	2	14	9	7	2
RATE	1.6	1.0	1.0	1.1	.28	1.4	1.2	1.2	.58	.65	.89

8AF	15AF	1984 CLASS A MISHAPS		CLASS B		FLYING HOURS	
		TR-1 B-52G B-52G	JULY OCT DEC	DEC	1	DEC	23,081*
				1984	5		
				CLASS C		1984	337,282*
				DEC	10		
				1984	185		

*ESTIMATED FLYING HOURS



SR-71 AIRCREW ENTRY REQUIREMENTS:

1. LESS THAN 16 YRS TAFMCS
2. Eligible for TS Clearance
3. Medically Qualified
4. Pilots: 1500 jet hrs (750 as acft cmdr)
RSOs: 1200 jet hrs; 15XX AFSC

DESIRED ATTRIBUTES: Aircraft diversity (some "fast mover" time and inflight refueling experience), strong professional record.

SELECTION PROCESS: If application recommended by a review board, the candidate completes a five-day interview at Beale AFB to include a thorough medical evaluation, simulator evaluation, interviews with the 9SRW staff, and, for pilots, a two-flight T-38 evaluation.

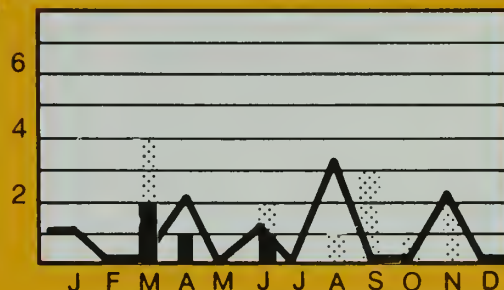
FOR MORE INFORMATION: Read AFR 36-20, para 8-33, or contact the Chief of Combat Crew Training, 4029SRTS, Autovon 368-2223/4759.



1984

MISSILE MISHAPS

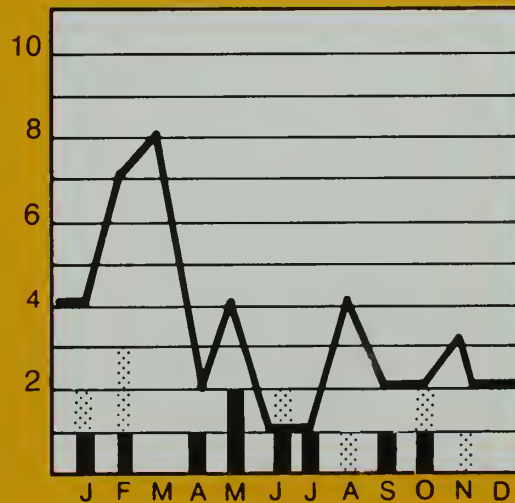
TITAN



AIR LAUNCH MISSILE



MINUTEMAN



PERSONNEL
ERROR

NON PERSONNEL
ERROR

TOTAL MISHAPS
1983

They Never Taught Me This . . .

1Lt Lawrence B. Everett
351 SMW, Whiteman AFB

It was 0900 when we finally departed the back gate of the base to assume our alert duties. We were lucky enough to be chosen to go the Hotel Launch Control Center (LCC), the alternate command post for the 351 SMW and also the LCC farthest from the base. The morning briefings had gone smoothly with few questions or comments from the crew force. The safety briefings, weather warnings, and existing road hazards hadn't really concerned us because my crew partner and I had nearly 400 alert tours between us. We pointed our crew vehicle south and settled back for what we hoped would be a pleasant 100+ mile excursion.

Despite the early hour, the heat was almost unbearable as we continued our trek southward. Finally we reached the halfway point of our journey. The tourists were out in full force and as we neared Truman Lake, the traffic was one long string in both lanes. At last we reached the lake and traffic began to thin as the campers, boaters and vacationers made their exits. I began to relax a little as we neared the last leg of our journey.

Suddenly from behind an approaching semi, a yellow Camaro pulled out to pass. A million thoughts flashed through my mind as I analyzed the situation. I braked hard and started for the shoulder just as I realized the Camaro had the same idea. Quickly I steered back into my lane as the semi passed us on the left and the Camaro passed us on the right. It was over, we had been untouched and the Camaro was around the semi as if nothing had happened. Slowly the realization of what could have happened began to hit us.

The rest of the trip was uneventful, and I hoped that the alert would be quiet because I'd had enough excitement for quite awhile. We had a fairly quick changeover, and as the old crew departed, I relayed our near miss and suggested that they call the base and ask for permission to take the alternate route back to the base to avoid most of the traffic.

The alert was now ours, and it was shaping up to be a busy one. Three of our launch facilities (LFs) were penetrated, a category I element was moving to another of our

LFs, a maintenance team was in the launch control equipment building (LCEB) for environmental control system (ECS) training, and the facility manager (FM) wanted to know when he could come down and clean. All we needed to complete the picture was for the flight security controller (FSC) to call and tell us that the armed response team (ART) was going to accomplish LF security checks. He did.

Right after I safety briefed the ART and dispatched them off site, the wing command post (WCP) controller called and said the airborne launch control center (ALCC) was in the area and would conduct an emergency rocket communications systems (ERCS) exercise and Giant Ball exercise. At this point, things were getting a little hectic. But my deputy and I could handle it, because, after all, we had nearly 400 alerts to our credit.

We were on the phone, radio, or jackbox almost continuously for six hours directing one team, patching in another team with wing job control (WJC), processing teams on site, processing teams off site, coordinating and accomplishing post maintenance tasks, and somehow we also managed to do our LCC inspections.

The category I element left LF-06 for the base, and soon we had only one two-man team, their supervisor, and one security guard left on site. After the extended period of silencing buzzers and alarms, the silence was almost eerie. The peace and quiet was soon shattered by the telephone. I punched in LF-06 and the team chief relayed that his assistant team chief was feeling faint, chilled, and was having difficulty breathing. We quickly connected the team chief to WCP and implemented MCC contingency procedures. Since LF-06 was quite some distance from our launch control facility (LCF) and the only litter in the flight area was at the LCF, we dispatched our ART immediately to LF-06 with the litter. The extra manpower would prove to be critical later when the team member had to be pulled up the access shaft.

Suddenly the team chief reported that his assistant had passed out and was now trapped inside the launcher equipment room (LER). The ART was still ten minutes away

from the site with the litter. We patched in a doctor from the hospital who directed medical attention for the stricken individual. When his condition had stabilized, we coordinated with the team chief to insure proper control of codes and other requirements that had to be accomplished.

At last the ART arrived. The assistant was evacuated topside, and we coordinated with the ART team to take the individual to the nearest hospital for treatment. We later learned that the assistant team chief had suffered a heat stroke and was recovering. He would be transferred to the base hospital for observation later that night.

Our alert will go down in the books as just another alert — just as alerts have gone on before and just as alerts will go on in the future. It could have been any crew on duty that day, and things would have been handled just as smoothly, just as professionally, and the main reason for our alert — deterrence — would have been fulfilled. But my crew partner and I will probably always remember this particular alert because we met the challenge of being part of the team. Part of the team that not only accomplished the mission — but extended a helping hand to one of its own.

But, they never taught me that it would be like this . . . or did they? The missile procedures trainer was never this busy at the CCTS. They did have multiple scenario events that established a basis for setting priorities, though. Practice and 400 combined alerts helped ingrain the decision process to be almost automatic. How about the recurring training in the missile procedures trainer? That process continued to refine the idea of crew coordination and checklist discipline so as not to overlook the important things when the going gets really hectic. Even code component training, emergency war order (EWO) training, and missile safety training had played in this alert. And what about the defensive driving course that the DO had decreed for crewmembers? Who knows, but those spins on the "skid pad" might have made the difference, along with help from the Almighty, on the road that day when the Camaro filled my windshield. Now they never taught me all this — or did they?



The SAC Safety Screen is an honor roll of SAC's most professional crews. To gain listing on the Screen, crew members must be nominated by their unit commanders and meet high selection criteria of experience in their aircraft or missile system IAW AFR 127-2/SS1.

78 AREFS (AFRES), Barksdale AFB: AC Maj Edward H Rooks Jr, CP Maj William R Losey, FE TSgt Kenneth R Cox, BO TSgt Charles W Younce

71 AREFS, Barksdale Crew S-102: P Maj Joseph M Jewel, CP Capt Michael J Henderson, N Capt Joel R Sedgwick, B MSgt Donald C Maddox

71 AREFS, Barksdale Crew R-135: P Maj John D Fleming, CP 1Lt Charles E Toland, N 2Lt Jimmie D Riley, N SSgt Jerry L Howe

62 BMS, Barksdale Crew S-91: IP Capt John D Harris, IC Capt Harry B McCraher, IR Capt Robert D Montgomery, IN 1Lt Stephen G Shahabian, IE Capt William J Britton, IG TSgt Ralph F Davino

7 AREFS, Carswell Crew E-11: AC Maj Jerry D Sutherland, CP 1Lt William Patton, N 1Lt Michael J Mixon, BO A1C Sandra L Carter

9 BMS, Carswell Crew S-52: AC Maj Danny M Rouse, CP 1Lt Kevin P McCandless, TN Capt Mark Antokowicz, N 1Lt Richard D Defries, EW Capt Michael L Polansky, G SSgt Kendall R Babbitt

20 BMS, Carswell Crew R-13: AC Capt Allan S Green, CP 1Lt Robert G Russell, RN Capt Steven D Watkins, N 1Lt Jeffery L Smith, EW 1Lt Mark L Landis, G TSgt George Woodrey

22 AREFS, March Crew E-121: FP Capt Gary W Schroeder, CP Capt Richard J Johnson, NN 1Lt Bart J Devlin, IB SSgt Derek T Suficiencia

22 AREFS, March Crew R-123: FP Capt Richard O Haag, CP 1Lt Scott A Burton, NN 1Lt William B Featherston, IB SSgt Carl S Seaberry

2 ACCS, Offutt Crew E-109: IP Capt Billy K Osborn, CP Capt John J Rome, NN 1Lt Allyson K Linder, NN 2Lt Daniel V Hackman, IBO SSgt Carmen N Vallejo

99 AREFS, Robins Crew E-181: IP Capt Rodney S Crist, CP Capt Richard A May, NN 1Lt Michael A Farmakis, BO A1C Mary K Headrick

46 AREFS, K I Sawyer Crew S-118: P Maj Paul B Knowlton, CP 1Lt Stephen P Sabourin, N Capt Thomas R Mabry, BO SSgt Donald O Frol

46 AREFS, K I Sawyer Crew E-122: P Capt William B Shields, CP 1Lt Ellen J Staley, N 2Lt Jeffrey L Cassens, BO A1C Robert W Derrick

644 BMS, K I Sawyer Crew E-23: P Capt Don M Novak, CP 1Lt Paul F Deckers, RN Capt Carlos E Delagadillo, IN 1Lt Robert B Clardy, NN 1Lt Stephen J Stoltz, EW 1Lt Bruce W Fahrner, AG SSgt Richard W Marshall

644 BMS, K I Sawyer Crew E-15: P Capt Gerald T Smith, CP 2Lt Stephen V Tate, RN Capt Donald E Vanslambrook, NN Capt Steven D Marshall, EW 1Lt Richard J Josten, AG TSgt Scott R Gygi

393 BMS, Pease Crew E-15: P Capt Dale Hamilton, RN Capt William Chambers

60 BMS, Andersen Crew R-34: P Capt Byron D Woods, CP 1Lt Roger N Anderson Jr, RN Capt Thomas L Martin, N 1Lt Timothy D Vinoski, EWO 1Lt Albert F Spohn, ADG SrA Wesley H Carter

60 BMS, Andersen Crew E-11: P Capt Robert D Perry, CP 1Lt Warren A Woosrow Jr, RN Capt Glenn A Pallazza, N 1Lt Donald E Simmons, EWO 1Lt John A Damico, ADG Sgt James R Howard

351 SMW, Whiteman Crew S-070: MCCC Capt Roy R Parker, DMCCC 2Lt Mark A Carlson

351 SMW, Whiteman Crew R-147: MCCC Capt Michael L Nennally, DMCCC 2Lt Glenn E Robinson

90 SMW, F E Warren Crew R-113: MCCC 1Lt James S Powlowski, DMCCC 2Lt Ralph F Bowseth

341 SMW, Malmstrom Crew R-173: MCCC 1Lt Thomas P Considine, DMCCC 2Lt Jeffrey A Hunt

44 SMW, Ellsworth Crew R-043: 1Lt Sean P Cassidy, DMCCC 2Lt Michael C McGhee



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Go By The Book

Tech Data —
Read it . . . Believe it
. . . Use it